DOCUMENT RESUME

ED 047 378 EA 003 288

AUTHOR Etnyre, Vance A.
TITLE Information Requirements of the University Planning Environment.
PUB DATE 20 Oct 70
NOTE 13p.; Paper presented at Institute of Management Sciences American Meeting (11th, Los Angeles, California, October 19-21, 1970)

EDRS PRICE EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS *Data Collection, *Data Processing, Information Needs, *Information Systems, Management Systems, Master Plans, *Planning, *Universities

ABSTRACT

Information systems developed to support university planning must be designed to insure that all planning needs can be met. Only highly flexible, highly integrated information systems can meet current planning requirements. Such systems should be designed in a modular fashion and employ user-oriented languages to select and combine the system components to achieve each required task. (Author)

EDO 47378

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Information Requirements of the University Planning Environment[1]

by

Vance A. Etnyre
University of Illinois[2]
Urbana, Illinois

EA 003 288

[1]Presented at the Eleventh American Meeting of the Institute of Management Science in Los Angeles, California, October 20, 1970.

[2]Lecturer, Department of Business Administration

Information Requirements of the University Planning Environment

The change in decades from the 1960's to the 1970's has brought about vast changes in the environment in which universities must operate. Universities are being asked to provide many new programs to keep pace with the rapid changes in our society and to respond to problems which previously had been ignored. Environmental sciences, information sciences, and health care are examples of fields where new programs are being started or expanded at a very rapid rate. Many universities are being asked to provide new opportunities for those who, because of limitations in cultural background, had previously been denied the chance for a college education. At all levels, universities are being asked to provide more responsive and more innovative educational programs for more people.

In a time of social, economic, and political turmoil, students are no longer willing to passively absorb the theories accepted by their predecessors. They are asking for direct participation in programs which are more relevant to the problems of society. These requests, often expressed as demands, present a significant challenge to the flexibility of current organizational structures. As administrators are asked to make their institutions more viable instruments for the education of young men and women, even the basic goals of the university are brought under question.

Yet these profound changes are being requested at a time when most university budgets are being trimmed to the bare necessities. Universities are finding that they can no longer rely on past performance as a justification for substantial annual budget increases. They can no longer rely on optimistic

promises and lofty goals in negotiating for money to support new programs and the expansion of old programs. University administrators must now produce meaningful quantitative evidence to justify each new dollar they wish to spend. In short, universities are being asked to do a better job of planning.

What is University Planning?

In trying to describe university planning, I am reminded of the story of three blind men who came upon an elephant and later tried to describe their experiences.[1] When administrators at various levels attempt to describe university planning, each sees the planning function from his own point of view. It is usually possible, however, to separate descriptions of university planning into three categories which I will call strategic planning, tactical planning, and operational planning.

In long-term or strategic planning, university administrators are required to define the basic goals and policies to be used in developing all university programs. University administrators must ask themselves "Are we asking the right questions?" and "Are we headed in the right direction?". They must decide what areas of society will be studied, and what emphasis will be put on each area. The questions concerning strategic goals and policy are very general in nature; they have many dimensions and degress of freedom.

The next level of university planning, that of tactical planning, deals

---

[1]The first, who walked into the side of the elephant, said that it was like a soft, fat wall. The second, encountering only the trunk, thought the elephant was like a tree. The third, who was brushed by the elephant's tail, said the animal was very much like a snake.

with the implementation of the "master plan" or strategic plan of the university. The tactical plan must conform to the policies set down in the strategic plan, but must be more specific in nature. In forming the tactical plan, many alternatives must be formulated, analysed, and evaluated. With the basic structure of the university already formulated in the strategic plan, tactical decision making often becomes a choice from a set of alternatives which are either known, or can be predicted within certain limits.

Once the resources have been scheduled at the tactical planning level, operational policies must be formulated to implement and monitor these tactical plans. First, operational goals must be established. Then procedures must be established for making corrections to any discrepancies between the actual operation of the university and its operational goals.

Distinguishing Between Different Levels of Planning

One criterion which can be used to distinguish the levels of university planning is the frequency at which new plans are required for each level. This frequency is determined by the rate of change of those variables which must be monitored and controlled at each level.

At the operational level, the planning variables change very rapidly. Bills come due from day to day; payrolls must be produced on a weekly, bi-weekly, or monthly basis; and accounts must be balanced at the end of each day, week, or month. The operational planning interval must be short enough to accommodate these changes.

At the tactical planning level, the rate of change of the decision variables is not as rapid as that of the operational level. Budgets are made

on a yearly basis. State supported universities often use biannual budgets which coincide with the sessions of the state legislature. The tactical plan sets forth the activities to be carried out within the budgeting period, and allocates resources to each program and organizational unit within the university during that period.

The "long range" or strategic planning horizon for most universities often extends five to ten years into the future. Many quantities, assumed to have fixed values within the tactical planning period, must be considered as variables during the longer strategic planning period. Some of the variables which fall into this category are: the amount of classroom space available, the amount of laboratory space available, the number of qualified teachers available within each field, and the courses to be taught within each area.

Indeterminacy in Planning

Another criterion which may be used to discriminate between levels of university planning is the degree of indeterminacy associated with the basic "state variables" of the university. Certain variables are called "state variables" because their values can be used to characterize or describe the state of the university. The number of courses and type of courses to be taught in each curriculum, the number of students and the number of faculty members assigned to each curriculum, and level and type of resources used to support each program, belong in this category because their values can be used at any time to determine levels of activity within the university.

At the operational level, the state variables can be monitored and measured very accurately. At the tactical planning level, variables such as enrollments and levels of staff activity cannot be known precisely throughout

the entire planning period. In such cases, it is often possible to assign estimated values to these variables in such a way that the variances from these estimate values can be controlled within certain limits. Variables which are beyond the control of university administrators are often described with probability distributions which allow the planner to estimate the effects of these variables within certain confidence intervals. These intervals are often small enough to allow for a type of planning which is nearly deterministic in nature.

In strategic planning, the values of the state variables can vary over wide ranges. Some variables, such as available building space, can be predicted within five percent quite easily. Other state variables, such as the demand for certain programs, often vary as much as fifty to one hundred percent from their predicted values. Within this environment, strategic planning becomes a process of forming hypotheses and attempting various tests on these hypotheses. At the strategic planning level, it must be realized that conceptual uncertainty is not a symptom of poor planning. Indeed, long-range or strategic planning has often been defined as that type of planning in which all quantities, including the basic goals and basic structures of the organization, must be treated as variables.

Proximate Goals and System Failure

A phenomenon which is very important in determining the success or failure of university planning is the conflict between the strategic or tactical goals of the university, and the proximate goals[2] used by the various

[2]The name "proximate goal" is given to the interpretation of a goal made by an organizational sub-unit. Such goals are defined in terms of the interests, resources, and capabilities of the sub-unit rather than those of the parent organization.

organizational sub-units within the university. As an example of this conflict, consider the fact that administrators usually feel most comfortable when they can do their planning within a well-known structure. One approach to strategic planning, therefore, is to attempt to stabilize the environment and the structure of the university so that planning for the university can be handled in a simple, deterministic manner. Since most university information systems are set up to supply information about the current university structure, the tendency to stabilize the current structure is greatly enhanced by an inflexible information system. Maintaining the structure of current information systems is often a proximate goal of operational planners. This can be a great detriment to effective, long-range planning, where the structure of the system must be considered as a variable.

At the other extreme, long-range planning enthusiasts may wish to discard current information systems in favor of new "scientific management" packages which provide automatic forcasting facilities and algorithms for the allocation of resources. Such packages often require a fixed format for input data. When this format is incompatible with the formats of current operational data, a change in the operational system is often suggested. Following either of the extremes just mentioned can have disastrous effects on university planning.

Similarities in University Planning Requirements

Although the three levels of university planning can be differentiated in many ways (frequency of use, response time, types of goals, degree of detail, degree of determinacy, etc.) it is the similarities between these levels that are of greatest interest in designing an integrated planning system.

It is the similarities in planning requirements which must be recognized and utilized so that separate systems do not evolve to support each level of university planning.

If separate support systems evolve for each level of planning, many facilities will be duplicated within each system. When facilities are duplicated (as opposed to being shared) two problems often arise. First, the cost of the total system increases as independent subsystems are proliferated. Second, the reliability of individual components may decrease as duplicate functions are provided. These problems might occur when separate data bases are created, when separate sets of procedures are used to operate on the data, or when separate mechanisms are maintained for interaction with the planning system.

Functional Aspects of University Planning

To show how similarities can be utilized to provide consistency and efficiency in university planning, a functional approach to planning must be considered. In taking this approach, the similarities which exist at various levels of planning can be discussed in three categories: 1) data base considerations, 2) processing requirements and 3) the user's mode of interaction with the system.

Data Base Considerations

All levels of university planning require the processing of information. Data must be collected, checked, corrected when necessary, cataloged, and stored. The data must be stored in such a manner that it can be updated as new events are recorded, and retrieved from time to time for particular

applications. Although the content of the data may vary (in scope and degree of detail) from level to level, the schemes that are used to gather, verify, catalogue, store, retrieve, and update the data may be used at any level.

At the operational level, for example, student data will contain the names, addresses, heights, weights, birthdates, birthplaces and telephone numbers of all students enrolled in the university. There will also be records which identify the courses taken each semester by each student and the grades received each semester by each student. At certain times of the year, reports will be produced which contain detailed information about the entire population of students. This information might be used to monitor the progress of all students. Often, special listings might be made of those students who share common attributes (honor roll or academic probation). A single data base should be used as a source for reports which are made on a regular basis, and reports which are produced for a particular set of circumstances.

At the tactical level, information about student class loads might be required to aid in allocating classrooms to various departments. If a separate source of information is maintained for this type of application, many of the facilities required to collect, store, and process this information will duplicate those used for the operational data base. Costs will be incurred for each duplicate facility. If duplicate efforts are not made in maintaining the separate data bases, inconsistencies will occur in the two sets of data. These inconsistencies will reduce the credibility of any statements supported by data from the duplicate data bases.

At the strategic planning level, enrollments must be examined to provide

information about growth of various fields of study. This information should be obtained from an accumulation of operating data rather than a separate compilation. To provide consistent and efficient planning, the same operational data base can be used to supply information about housing requirements, teaching loads, course enrollments, and many other aspects of university endeavor. This information can be used in the operational, tactical, or strategic phases of university planning.

In general, the content of data used in operational planning will be similar for most institutions. The information needed for tactical and strategic planning will vary from institution to institution. Because of the diversity and uncertainty which exist in the university environment, it is impractical to formulate a universal data base for university planning. The formulation of a data base must allow for flexibility as well as efficiency in the planning process.

Processing Requirements

At each level of university planning, various operations must be applied to selected data items to produce specific quantities of information. Many operations are common to all levels of planning. Sorting data items, listing and counting data items, and taking sums and averages are a few examples of operations used at every level of planning. One of the most useful operations at any level is the selection of specific sets of data items or data records from an entire population of data. In many planning situations, an initial selection of data must be made according to some attribute or property common to the selected data items. Such an operation is necessary if the frequently

used "Give them all we have and let them throw away what they don't need" approach is to be avoided. As Ackoff pointed out in his article "Management Misinformation Systems",[3] providing more information does not necessarily improve planning; in fact it often leads to very ineffective planning. In order to reduce extraneous information, a mechanism must be provided for specifying the selection criteria to be used with each application. An information filter must then be provided to select only those items which satisfy the specified criteria. This mechanism can be used with a variety of other operators (to accumulate, list, analyze, or display information) to satisfy a wide variety of information requirements at every level of planning.

Using this approach, for example, the report writing procedure used to print departmental grade reports at the end of each semester could be combined with an information filter to print warning reports for advisors to identify those students who have not met certain academic requirements. This process would be less expensive than producing an additional report on the full population of student grades, and would be far more convenient for the advisors than an additional copy of grades for all students. At the tactical planning level, an algorithm might be used each year to allocate research facilities to all departments within the university. If a new research project is funded at mid-year, it might be useful to combine the allocation algorithm with an information filter in order to allocate the new funds to those departments participating in the project. The real savings available with this approach will occur if the same mechanism used to filter

---

[3] Management Science, December 1967.

information about student grades at the operational level can be used to filter information about departmental research efforts for tactical planning. This economy can be realized if the techniques used to implement the information filter are independent of the formats used to store data. This independence can be achieved within a highly modular system where the operations to be performed (sorting, selecting subsets, producing tabular or graphical displays, or generating reports) are flexible enough to be applied to selected subsets from many different files. The mechanisms used to apply these operators to different sets of data items must be designed in such a way that they are easy to learn, and efficient to use.

Mode of Interaction

To fully realize the benefits available through a modular, functional information system, planners at all levels must have a means of entry into the system, including one or more languages for specifying the operations to be applied and the data to be selected. Many administrators feel that direct (real-time) interaction with a computer would help to solve their information processing problems. In order to provide this capability, languages of a "higher order" than the common procedural languages (COBOL, FORTRAN, ALGOL, Pl/1) are required. A number of problem-oriented languages are already available for special classes of problems. As techniques for implementing "user-defined" languages become more widely accepted, real-time management will become a more realistic goal for university administrators. The benefits of user-defined languages will exist at each level of university planning.

Summary

As information systems are developed to support university planning, two considerations must always be kept in mind. First, the systems must be designed to insure that all valid planning needs -- strategic, tactical and operational -- can be met. Proponents of one type of planning must never dictate a system which cannot meet the needs of other university planners. Second, care must be taken so that independent systems do not evolve for each level of university planning. The creation of independent systems tends to cause disintegration and inconsistency of information services and greatly increases the cost of university planning. Only highly flexible, but highly integrated information systems can meet current planning requirements. Such systems should be designed in a modular fashion and should employ user-oriented languages to select and combine the system components to achieve each task that is required.